

CLAIMS

We claim:

1. An adaptive optics system comprising:
 - 2 a deformable mirror having a reflective surface and an electrode surface, the
 - 3 electrode surface including a plurality of electrodes, the reflective
 - 4 surface configured to deform responsive to an electric potential on
 - 5 one or more of the electrodes;
 - 6 an insulating layer formed on the electrode surface of the deformable mirror,
 - 7 the insulating layer exposing at least a portion of the electrodes; and
 - 8 a plurality of conductive traces formed on the insulating layer, each
 - 9 conductive trace coupling an electrode to a perimeter region of the
 - 10 deformable mirror.
- 1 2. The system of claim 1, wherein the deformable mirror comprises an
- 3 electro-restrictive material that deforms responsive to an electrical field caused by an
- 4 electric potential on one or more of the electrodes.
- 1 3. The system of claim 1, wherein the deformable mirror comprises a
- 2 piezoelectric material that deforms responsive to an electrical field caused by an electric
- 3 potential on one or more of the electrodes.
- 1 4. The system of claim 1, wherein each conductive trace is coupled to a
- 2 bonding pad at the perimeter region of the mirror.

- 1 5. The system of claim 1, further comprising:
2 a protective coating covering at least a portion of the conductive traces;
- 1 6. The system of claim 1, wherein the protective coating comprises a
2 dielectric material.
- 1 7. The system of claim 1, wherein the perimeter region of the mirror
2 corresponds to an edge of the mirror.
- 1 8. The system of claim 1, further comprising:
2 a circuit board having plurality of conductors thereon, each of the conductors
3 for providing an electric potential to an electrode for deforming the
4 deformable mirror; and
5 a strip connector coupled between the circuit board and the deformable
6 mirror, the strip connector including a plurality of conductors for
7 electrically coupling the conductors on the circuit board to
8 corresponding conductive traces on the insulating layer of the
9 deformable mirror.
- 1 9. The system of claim 8, wherein the strip connector is a zebra strip
2 connector.

1 10. The system of claim 8, wherein:

2 each conductive trace is coupled to a bonding pad, the bonding pads of the

3 mirror forming a generally circular pattern at the perimeter region of

4 the mirror, and

5 the circuit board further includes a plurality of bonding pads coupled to the

6 conductors on the circuit board, the bonding pads of the circuit board

7 forming a generally circular pattern and corresponding to the bonding

8 pads of the mirror.

1 11. The system of claim 8, further comprising:

2 a retaining plate mechanically coupled to the circuit board for providing a

3 compressive force on the strip connector between the deformable

4 mirror and the circuit board; and

5 a resilient element disposed between the deformable mirror and the retaining

6 plate for modulating the compressive force.

1 12. A deformable mirror for an adaptive optics system, the mirror

2 comprising:

3 a reflective surface having a central region for receiving light;

4 an electro-restrictive material configured to deform responsive to an electric

5 potential, wherein a deformation of the electro-restrictive material

6 causes the reflective surface to deform;

7 a plurality of electrodes coupled to the electro-restrictive material, each
8 electrode for providing an electrical potential to a portion of the
9 electro-restrictive material; and
10 a plurality of electrical connectors, each electrical connector electrically
11 coupling an electrode to a perimeter region of the deformable mirror.

1 13. The deformable mirror of claim 12, wherein the perimeter region of the
2 deformable mirror corresponds to a physical edge of the deformable mirror.

1 14. The deformable mirror of claim 12, wherein the perimeter region of the
2 deformable mirror corresponds to a region of the deformable mirror that does not
3 substantially deform.

1 15. The deformable mirror of claim 12, wherein the perimeter region of the
2 deformable mirror is an area of the deformable mirror outside the placement of the
3 electrodes.

1 16. The deformable mirror of claim 12, further comprising:
2 an insulating layer over the electrodes and exposing at least a portion of each
3 electrode, wherein each electrical conductor is a conductive trace
4 formed on the insulating layer.

1 17. The deformable mirror of claim 16, wherein each conductive trace leads
2 to a bonding pad in perimeter region of the deformable mirror.

1 18. A method of manufacturing a deformable mirror for an adaptive optics
2 system, the deformable mirror configured to deform responsive to an electric potential
3 applied to the deformable mirror, the method comprising:

4 masking an electrode pattern on a back surface of the deformable mirror, the
5 electrode pattern defining a plurality of electrode segments;
6 depositing a conductive layer on the back surface to form the plurality of
7 electrode segments;
8 masking an insulator pattern over the electrode segments, the insulator
9 pattern exposing at least a portion of each electrode segment;
10 depositing an insulating material over the electrode segments according to the
11 insulator pattern;
12 masking a trace pattern for defining a plurality of connections, each
13 connection from an exposed location of an electrode segment to a
14 location in a perimeter region of the deformable mirror; and
15 depositing conductive material to form a plurality of conductive traces
16 according to the trace pattern.

1 19. The method of claim 18, wherein the insulator pattern includes at least
2 one hole for each electrode segment, the hole for exposing the electrode segment.

1 20. The method of claim 18, wherein the trace pattern further defines a
2 bonding pad in a perimeter region of the deformable mirror for each conductive trace.

1 21. The method of claim 18, further comprising:
2 applying a protective coating over at least a portion of the conductive traces.

1 22. The method of claim 21, wherein protective coating comprises a
2 dielectric material.

1 23. The method of claim 18, further comprising:
2 electrically coupling the deformable mirror to a circuit board so that each of
3 the conductive traces on the mirror is coupled to a corresponding
4 conductor on the circuit board, the circuit board for providing
5 electrical potential to the conductive traces.

1 24. The method of claim 23, wherein the deformable mirror is coupled to the
2 circuit board using a strip connector.

1 25. The method of claim 24, wherein the strip connector is a zebra strip
2 connector.

1 26. The method of claim 23, further comprising:
2 securing the deformable mirror in electrical connection with the circuit board
3 with a retaining plate, the retaining plate providing a compressive
4 force between the deformable mirror and the circuit board.

1 27. The method of claim 26, further comprising:
2 disposing a resilient element between the deformable mirror and the retaining
3 plate for modulating the compressive force.